

RC 156
.L83
Copy 1

AN
ESSAY
ON THE
REMOTE AND PROXIMATE CAUSES
OF
MIASMATIC FEVER.

BY
C. A. LOGAN, M. D.

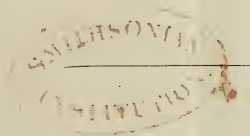
PUBLISHED BY ORDER OF THE LEAVENWORTH MEDICAL AND SURGICAL ASSOCIATION.

LEAVENWORTH:
PRINTED AT THE DAILY CONSERVATIVE BOOK AND JOB OFFICE.

1861.

AN
ESSAY
ON THE
REMOTE AND PROXIMATE CAUSES
OF
MIASMATIC · FEVER.

BY
C. A. LOGAN, M. D.



PUBLISHED BY ORDER OF THE LEAVENWORTH MEDICAL AND SURGICAL ASSOCIATION.

✓
LEAVENWORTH:

PRINTED AT THE DAILY CONSERVATIVE BOOK AND JOB OFFICE.

1861.

RQ 81
✓ 83

KC 156
L 83

ESSAY ON THE REMOTE AND PROXIMATE CAUSES OF MIASMATIC FEVER.

READ BEFORE THE LEAVENWORTH MEDICAL AND SURGICAL
ASSOCIATION, BY C. A. LOGAN, M. D., FEBRUARY 7, 1861.

MR. PRESIDENT AND GENTLEMEN OF THE ASSOCIATION :

At the meeting of your Association, held upon the first Thursday in January, of the present year, a very able essay upon the subject of "Malarious Fevers," was read before your body.

In the discussion which followed, the writer of this paper took occasion to express his dissent from the commonly received doctrines upon the subject, and also to put forward, in a crude manner, some ideas which were original with himself.

The object of this essay will be to elaborate those ideas to a certain extent, and likewise to advance the author's reasons, for his presumptuous heresy in the Malarious dogma.

In doing this, perhaps, an apology is necessary for again bringing the subject under discussion ; but as a correct knowledge of periodic fevers, their causation and treatment, is of paramount importance to the Western practitioner, it is probable, that much good may result to all, by a free interchange of experience and sentiment.

The exciting cause of that peculiar class of fevers distinguished by *periodicity*, is asserted to be, a subtle agent which has received the designation of Malaria, Miasmata or Marsh Miasm ; the first two terms as generally used, being indicative of its nature, and the last, of its origin.

Of all the mysterious agents, which lurk in every hidden shape to prey upon the health and happiness of the human family, this demon is invested with the most extravagant, contradictory and incomprehensible properties.

Although the idea of pestiferous emanations from low, swampy localities, is coeval with the fall of man, perhaps, yet a Roman physician, Lancisi, in 1695 obtained the questionable credit of seizing this monster from out the varied collection in Pandora's Box, and exhibiting his distinctive species to a wondering world.

Since that period, new attributes have been added, to meet the objections that have been urged against the reality of the ethereal and insidious foe, until at this time, the theory of his composition and properties is so arranged as to meet, however imperfectly, every attack that may be brought against him.

As examples at a glance, of the harmony of the theoretical properties of this specific poison, may be mentioned the following, collated from standard authors.

Miasmata are *produced* by vegetable decomposition, and "are dissipated, arrested, decomposed, absorbed or respired by plants." Miasmata are *produced* by a certain degree of heat, and are *checked*, by a certain other degree of heat. Miasmata are generated profusely at a temperature between 60° and 100°, and yet are dissipated by the ordinary heat of a camp or house fire.

Miasmata being generated profusely by vegetable decomposition, it is found necessary to account for the absence of the effects of the poison in large cities, and old settled communities, by supposing an antidotal property in the smoke of cities, and the highly cultivated condition of old settled communities. Miasmata are of greater specific gravity than the atmosphere, yet are blown by winds over the highest elevations. Miasmata are produced by *moisture*, and a degree of heat between 60° and 100° F, (being checked at a temperature either below the first or above the second,) and yet, says a celebrated author, "the noxious effects of Malaria are for the most part produced in all their virulence and intensity in autumn, after the heat and *drought* of the summer. The *hotter* and *drier* the preceding summer, the more frequent and fatal are the autumnal fevers." It having been established beyond dispute by Ferguson, Sir Gilbert Blane and others, that periodical fevers exist where there can be no possibility of vegetation, Dr. Pickford says, "whether Dr. Ferguson has or has not succeeded in establishing his views, we need not stop to inquire; he, as well as Sir Gilbert Blane, has at least though unwittingly demonstrated that the *absence of vegetation* may be received as a tolerably sure indication of the *presence* of malaria. Whilst on the other hand, it has been clearly shown that the absence of malaria may be fully inferred from the *presence of vegetation*."

It is but just to say, however, that Dr. Pickford has gone a step further than the generally received theory of malarious production, and entertains quite a comprehensive view of its origin. His ideas will be mentioned presently.

Miasmata, then, are generally considered to be emanations from vegetable matter undergoing putrefaction, through the influence of moisture and a degree of heat ranging from 60° to 100° F. And yet it has been recorded by many authorities, that periodic fevers in their various types, are endemic to localities where the idea of vegetable putrefaction, and in some cases, of even vegetable existence, is entirely precluded. Dr. William Ferguson has contributed quite a number of such instances in his paper on the "Nature and History of the Marsh Poison," copious extracts from which, may be found in Watson's Practice of Physic.

Dr. Robert Jackson in his Treatise on Fevers, gives many examples of elevated localities in the West India Islands, not exposed to currents from swampy regions, where periodic fevers prevail.

Dr. Chisholm and others, record the existence of such fevers in argillaceous soils, where the reputed travelling facilities of the miasmata could not be adduced in explanation.

Vegetable putrefaction may exist in its most satisfactory state, and yet this periodic influence in fevers, be almost or quite absent.

Is there no vegetable matter in our Eastern States subjected to moisture, and a range of temperature between 60° and 100° F.? Are there no mill-ponds or river-bottoms in localities where ague is a stranger, and in which vegetable matter is con

stantly exposed to a reeking sun? On the other hand, why should persons be attacked with a periodic disease, upon visiting a "malarious region" for the first time, during a period when the thermometer stands below 60°, and all vegetable decomposition is suppressed? Yet that such is the case, is within the experience of us all. Here the inevitable *stock on hand* cannot be brought into requisition. Can there be any elimination of this morbid principle in our locality at this time, when the earth is covered with snow to the depth of several inches? And yet, are not all our diseases of a distinct periodic type?

We regard the alleged property of miasmata, to lie dormant in the system for an indefinite length of time, before being called into action, as having been trumped up purely for the purpose of supporting the theory, and as being devoid of all foundation. It is entirely averse to what we do know of the manifestations of the disease. Experience teaches us that it is when the body is debilitated by the summer heat, and acted upon by the depressing cold of the autumn night, that the enemy is most likely to invade the citadel; and not when the system is invigorated by a bracing air highly charged with oxygen, and the standard of health is at its acme.

Did it possess any such property, the person having passed through the fall unscathed, would escape until the vernal sun had again done the work of disarranging the secretions, and reducing the vital resistance.

But let us look at this matter of vegetable decomposition a little more critically.

It is a fact of general observation that malarious diseases are greatly ameliorated, if not dissipated, after the occurrence of the first frost; and yet, it is at this time that vegetable putrefaction is most active; large quantities of vegetation being killed by the frost, and subjected to putrefaction by the heat of the ensuing day, which, until the cold blasts of winter are upon us, is constantly above 60°. From the same circumstances we should expect our *vernal* periodics to be vastly more violent than those of autumn, because immense quantities of dead vegetation from the preceding year, are exposed to a spring sun. Yet all are agreed as to the fact of the mildness of the spring attack, compared with the autumnal.

Vegetable putrefaction is seen under its most favorable conditions, in the markets and vegetable gardens of large cities, where refuse vegetables are left for hours or days sweltering in the hot sun; and yet, so remarkably exempt are cities from periodic diseases, that a peculiar, antidotal property to the operation of miasmata in large communities, has had to be invoked to explain away this fatal objection.

In addition to this, as before remarked, periodic diseases prevail in all their intensity, in localities where vegetation is out of the question; and upon the other hand, they prevail but mildly, if at all, in some places where vegetable decomposition is most rife.

In confirmation of the first assertion, may be mentioned Cleghorn's observations upon the diseases of the rocky Isle of Minorca, in the Mediterranean; Ferguson's account of the encampment of the troops in Holland and Spain; Sir Gilbert Blane's description of the soil of Walcheren, and Ferguson's after-experience there; and Dr. Good, who said "he had seen regular tertians in the highest part of Islington, and also on the dry and gravelly coast of Gosport," a situation so healthy as to preclude all possibility of malaria. It was particularly remarked in all these places, that they could not have been subject to the *blowing over* process.

To these might be added many other authors in corroboration of the same facts.

In support of the second assertion, may be related Dr. Pritchett's observations while off the Western Coast of Africa and up the Niger. He instances the case of Singapore "lying under the direct rays of a vertical sun, abounding in swamps and jungle, and where all the conditions for the production of miasm or malaria, exist in perfection; but, yet this place enjoys great immunity from fever."

Dr. P. further instances the case of the river Hoogly, in Bengal, which overflowing its banks during August and September, is accompanied with a great degree of sickness; while in May and June when the river is low, and the banks exposed to the excessive heats of the sun, there is much less fever. Dr. P., as the result of his experience, pronounces the miasmatic doctrine, a mere hypothesis.

Another thing may be stated in this connection, mentioned by Dr. John Bell. It is asserted by the miasmaticists, that the evolution of this morbid principle, is checked by a heat under 60°, or over 100° F. This being so, the inhabitants of tropical climates, as the West Indies, &c., should suffer severely during the *winter* months, with periodical fevers, and be exempt from them during the *summer* months. For, according to Bancroft, in the winter months the average temperature is 70°, a heat favorable to the miasmatic exhalation; while during the summer, the thermometer ranges from 120° to 140° F. thereby checking its evolution. Yet we know that the winter season is that, which is comparatively healthy, and the summer that in which these fevers rage with all their violence.

But it is useless to pursue this matter further. Those of you, who have not already done so, will profit by reading Dr. John Bell's views on this subject, who announced his disbelief in this agency some thirty-five years ago, and in whose arguments and collection of facts, you will find much that cannot be reconciled with the miasmatic hypothesis.

The most delicate analysis of the air, in miasmatic localities, has failed to detect any agent which would *of itself*, produce Malarious fevers; and yet, when vegetables putrefy, the products unite in certain fixed compounds, and as such could not elude the chemist's scrutiny.

So convincing are the proofs against the *vegetable* origin of periodic fevers, that Dr. Watson abandons the theory, and maintains that the specific poison is eliminated from a light, porous soil saturated with moisture, and acted on by the appropriate solar heat. But to our mind, he has not improved the matter; for examples without number could be given of just such a soil, under precisely the conditions which he enumerates, that are entirely exempt from such diseases.

Dr. Pickford of London has recently published a very valuable work on Hygiene, in which he devotes considerable space to Infection and Contagion, classifying malaria under the former head. The author starts off with the remark that the meaning of the term malaria, is, a vitiated or contaminated atmosphere; and from the first page or two, we are led to infer that he is about to use the word as expressive of those morbid compounds resulting from animal and vegetable disorganization; noxious gases and the like, which when applied to the human body, cause disease by their pestiferous properties. Thus far, we have no special quarrel to make with the author; for the analogy of Contagion, whether in its solid, liquid or aeriform condition, strikes us as being at least reasonable, knowing as we do, by actual observation, that the contagion of typhus will invariably produce typhus; that of syphilis will produce syphilis; that of small-pox will produce small-pox, &c.

But here the contagious principle is *specific*, always produced from the same cause, and we are accordingly surprised to find the author while asserting that "marsh miasm is a specific poison, inducing specific effects upon the human body," defining marsh miasm, (used synonymously with malaria) to consist "of invisible and pestiferous emanations from the surface of the earth, and of poisonous and gaseous exhalations and effluvia from animal and vegetable matter in a state of decomposition; or according to Schonbein, of gaseous matters the product of purely chemical, or physical or physiologically chemical actions taking place within the earth or upon its surface; in stagnant waters, or in the atmosphere itself."

It would be rather wonderful, if in this comprehensive definition, the specific poison, allowing there is one, should not be included. To this definition it may be urged, that the conditions for the generation of this poison, may all be present in perfection, and yet not result in the production of the *specific* disease, periodic fever.

Did any one ever know of the contagion of gonorrhœa producing syphilis, or that of small-pox producing scarlatina? Yet these would be no more impossible than that, where a specific poison is eliminated by the existence of its prescribed conditions, there should be an absence of the specific disease; or where there is an absence of the specific poison, the disease should rage in its intensity.

Would a physician be apt to credit the assertion of a patient, that he had contracted a primary chancre spontaneously?

In order to establish a *specific cause* for anything, it must be shown to *follow invariably*, certain conditions, and as invariably to cause *certain effects*.

As Dr. Pickford advances in his account of malaria, he becomes so obscure and contradictory, as to be quite incomprehensible. At one time he urges the malarious poison, as the specific cause of periodic fever, and then speaks of it, as causing cholera.

Again he speaks of malaria in a general way, implying a depraved condition of the atmosphere, and then attaches to it, its specific influence. Again he speaks of miasmata as the result of vegetable decomposition, and represents their effects as being destroyed by a profuseness of vegetation. Again, where it has been shown that no vegetation could exist to putrefy, then, the poison, "like Banquo's ghost, that would not down," is set free from the aqueous material of the earth or air, and rages like a pestilence, because there is no vegetation to absorb it.

"It only remains to be shown," says he, "that malaria abounds in its most deadly form where *little or no vegetation* exists to deprive it of its poisonous properties, and that where *vegetation does exist in abundance*, with free ventilation, malaria is rendered almost, if not entirely innocuous." Here follow the instances which Ferguson and others, adduce to prove that vegetation has no part nor lot in the production of periodic fever.

However valuable the other portions of the work are, Dr. Pickford has certainly not cleared up the irreconcilable nature of this agent.

Nor can it be said, that the effort upon the part of others to prove the morbid influence to be due to gaseous compounds, which infest low and swampy places, has been any more successful, in the direction which seeks to attach to them a *specific* agency. That they may become *indirectly* instrumental in the production of fever will be shown hereafter.

These gases, it may at present be remarked, are the carbonic acid, carburetted and

sulphuretted hydrogen. Of these, Prof. Daniell has supposed the latter, to be the offending poison ; but to this it need only be answered in the language of Dr. Bell, that, " if such were the case, the inhabitants of large cities, where this gas is generated profusely, would be the greatest sufferers."

But Prof. Gardner, (Medical Chemistry) believes that he has detected the poison, " in a certain instable *organic* body, of which sulphur is a component, and which may be obtained by precipitating the vapor from a marsh in the morning before sunrise, and it blackens sulphuric acid. It consists of sulphur, carbon, hydrogen and probably oxygen. * * * * * This substance entering the lungs, is probably decomposed into sulphuretted hydrogen, carbonic acid and water. Hence the sulphuretted hydrogen is most probably the noxious body ; this enters the circulation, affects the blood, produces nervous symptoms, which have the intermittent or remittent type ; affects the liver and if taken in large quantity, produces nervous and vascular prostration with all the symptoms of yellow fever. These would be the effects of sulphuretted hydrogen. The best remedies, calomel and in chronic cases nitro-muriatic acid, both contain chlorine. The first of these is decomposed in the body, and they both evolve chlorine, which as we have seen, neutralizes the poisonous properties of sulphuretted hydrogen."

We are not able to discover the active difference between this theory and that of Prof. Daniell, as the poison is the same in both ; and whether it is *inhaled* as sulphuretted hydrogen, or generated in the lungs as such, can matter but little. Both theories are open to the same objection. In localities where sulphuretted hydrogen is evolved plentifully, (in large cities, &c.,) its effects are not manifested in the production of periodic fevers.

And there may be particularly urged against the hypothesis of Prof. Gardner, those cases before narrated, where these fevers occur in localities entirely destitute of materials to evolve an *organic* body, in the sense in which he employs the term, (*vide* Cleghorn, Ferguson, Good etc.) ; and also others, (as the swamps and jungles of Africa, mentioned by Pritchett,) where such a principle would be formed in its greatest perfection, and where the inhabitants are remarkably exempt from the disease.

With such facts staring us in the face, why do we so tenaciously adhere to a mythical assumption, incapable of demonstration by facts, and seldom made plausible by the remotest analogy ?

In the absence of any positive data, to establish a probability of *specific* influence, such as contagions, epidemics &c., much more reasonable, because according with observation and experience, is the theory advanced in recent years, which attributes periodical fevers to the poisonous influence upon the nervous system, of an undue accumulation of carbonaceous material in the blood, from whatever cause produced.

During the last seven years, it has been our fortune to reside in what are termed, malarious districts ; and we trust that we have honestly and laboriously studied these diseases, with a view to arrive at the truth. We may not have interpreted the book of nature intelligently, but the records of those seven years, have induced us to renounce the malarious doctrine, as not only fallacious, but as pernicious, because leading to a disregard of necessary measures of hygiene, and to a perverted medication.

To exemplify fully our position, we shall be necessitated to go into a detail, which may be considered tedious, but which the importance of the subject fully demands, if

we are to consider ourselves honest seekers after truth, regardless of theories whose etherial foundation is as light

“As the baseless fabric of a dream.”

In instituting an investigation of this kind, it becomes us to possess ourselves of an accurate knowledge of the organism in health, and then to note elaborately, those parts of the machine, whose function departs from the standard of integrity, necessary to the maintenance of a healthy equilibrium in the whole.

Probably, no point connected with this whole discussion, is settled upon with more unanimity than that the liver and spleen play an important part, in the progress of periodic fevers. Thus far, the road is a common one; but when the question arises, as to whether it be of a primary or secondary nature; the cause or the effect of a cause, it divides and leads to conclusions as opposite as the poles.

The liver has been termed, with reference to its depurating function, the abdominal lungs. It is a part of the physiological function of the liver, to remove from the circulation, in a very peculiar manner, large quantities of effete hydro-carbonaceous material, the result of the disintegration of the tissues, or the product of nutritive absorption. It accomplishes this act in the first case, by converting the excrementitious particles into *glyco-cholic* and *tauro-cholic* acids, the active constituents of the bile. These principles are made to play an important part in intestinal digestion, by being poured into the duodenum, in conjunction with the pancreatic fluid, where, after exercising an influence upon certain portions of the chyme, they are *re-absorbed* and carried again into the general circulation. Here the hydro-carbonaceous constituents of the acids above mentioned, are oxydized and eliminated by the lungs in the form of carbonic acid and water; while the other principles, as the alkaline bases and sulphur of the taurine are excreted by the kidneys.

In the second case, or where the hydro-carbonaceous material is the product of nutritive absorption, the liver converts all saccharine matter that may be brought to it, into *liver sugar*, and all oleaginous matter into *liver fat*, metamorphoses highly favorable to oxidation. These being carried into the circulation are burnt up, and yield carbonic acid and water.

Thus is a large quantity of carbonaceous material *indirectly* got rid of, being first made to subserve a purpose in digestion, and afterwards in the most eligible form, carried into the circulation, and aiding by its combustion in the sustenance of animal heat.

Upon glancing at this portion of the function of the liver, we remark that it does not eliminate the carbonaceous matter, in extra-uterine life, *directly*; but prepares it in an eligible form for oxidation or combustion, and is thus subordinate to the respiratory process. This preparation is *absolutely essential to life*, as a *transforming* agency is exercised over the constituents of which the bile is composed, without which death would be consequent upon their retention in the system.

The importance of this fact will be shown more fully hereafter.

We have in the *skin*, an efficient and important adjuvant to the lungs. Although the skin has been usually considered, to be allied in function with the kidneys exclusively, and in disease or obstruction vicarious to them, yet, numberless experiments have demonstrated the large amount of carbonic acid thrown off from the cutaneous surface in vaporous suspension. The most remarkable of these, are those of Dr.

Fourcalt, Anselmino, Lavoisier and Seguin, Valentin, Bischoff, Majendie, Regnault and Reiset, and probably others.

Fourcalt applied an impermeable coat of varnish over the skins of animals, which gave rise to a state termed by him "cutaneous asphyxia," marked by *imperfect arterialization of the blood* and subsequent death.

Seguin by inclosing his body in an air-tight bag, found by experiments carefully repeated, that the maximum loss in a state of rest, by pulmonary and cutaneous exhalation is 18 grains in a minute; and of these, *eleven* pass off by the skin, and *seven* by the lungs.

Of this exhalation, Regnault and Reiset have endeavored to ascertain what proportion is constituted of carbonic acid, and have arrived at the conclusion that 1-50th as much is thrown off from the skin as from the lungs.

But as Majendie and Fourcalt observed that when animals are covered with an impermeable coat of varnish, they soon die asphyxiated, the heart and lungs becoming gorged with blood, it is highly probable that a much greater amount is thrown off from the skin; as effects of such severity could not ensue from the mere retention of water in the system, which could easily be discharged by the kidneys or lungs.

Analogous effects to these ensue upon individuals subjected to great heats. Persons have gone with impunity into ovens whose temperature was from 400° to 600° F, when the air was *perfectly dry*, so as not to interfere with the rapid exhalation from the skin; but when the air was *moist*, preventing evaporation, the heat which could be borne with safety, was quite insignificant.

These observations prove conclusively, the auxillary nature of the cutaneous function, to the lungs, in ridding the system of carbonic acid.

This being the case, what effects are we to expect, and what results do we observe to follow, a suppression from external influences of this important function?

We answer to the latter question, that all the phenomena of periodic fever, have occurred in non-malarious regions consequent upon climatic vicissitudes, whereby the office of the skin has been interfered with or checked. Let us look at the immediate consequences of an interruption to the cutaneous respiration.

The large amount of disintegrated material, which it is the province of the skin to eliminate, is thrown upon the system to be expelled through other channels, or failing in this, to produce their respective toxæmic effects. In the case of the nitrogenized excretions, the kidneys come to the rescue and perform the duty of removal, if not too long burdened with it. The same is true of the lungs, to a certain extent, with the hydro-carbonaceous matter. But if the obstruction have existed any considerable length of time, and particularly if the period be one of great solar heat accompanied with a humid atmosphere, they are not equal to the double office. The consequence is, an imperfectly arterialized condition of the blood from a superabundance of hydro-carbon in the circulatory mass.

The liver now, through its decarbonizing function, is stimulated to increased activity by the super-amount of hydro-carbonaceous material presented to it, to metamorphose into fat and sugar, and to work up into bile. The increased supply of bilious matter will then, perhaps, be poured into the duodenum, and stimulating the intestines to action, a "bilious diarrhœa" ensues, and if the cause have ceased to operate, the individual is presently well again. We are acquainted with several persons who are endowed

with a "safety valve" arrangement of this kind, which protects them in slight attacks of "biliousness".

But suppose the cause continue to operate, what happens?

The hydro-carbon converted by the liver into bile, is stored up in the gall-bladder, distending it, to its utmost capacity. The starch and other matters transformed into sugar, are in that shape sent the rounds of the circulation unoxidized, and brought back again to the liver, together with fresh quantities of hydro-carbon. The liver soon in consequence of the over-stimulation, falls into a corresponding degree of torpor. The carbonaceous matters accumulate, and congestion of the liver follows,—portal venous congestion, just as the lungs are congested in the asphyxia produced in animals, as a consequence of suppressing completely the cutaneous function.

At this point the dangerous consequences of the retention of the *bile materials* in the blood, begin to manifest themselves, and disease commences in earnest. Up to this time, the individual has been merely afflicted with the premonitory symptoms described in what is called, the *forming stage* of fever. These symptoms are those resulting from impure blood being sent to the great nervous centres, such as a general aching and languor; dullness; an indisposition to mental or other exertion; headache; pain in the side, perhaps: sleepiness; in short, that state of good-for-nothingness which the French call *malaise*. If now the hand of science interpose, and an active cholagogue cathartic be administered, together with measures to restore the secretions generally, the threatened disease is averted, and the person restored to health.

Every day do we rescue persons, thus *on the brink of periodic fever*. We speak confidently upon this point, because we have been extremely careful, to look for a manifestation of periodic influence at this stage, and have become thoroughly satisfied *that none are developed, and that the portal congestion with its pathognomonic symptoms precedes all periodic indications*; in other words, being the cause, *and not the effect*. This we give you, as the result of seven years' critical observation.

But, if the cause instead of even now being removed, is intensified, then we have the slight pain in either side, (in the right from the liver, and in the left from the spleen, in consequence of the congestion of the portal vein extending to the splenic,) or in the shoulder in consequence of the nervous reflection, becoming perhaps, very acute; the symptoms generally are magnified, and others being added, they culminate in a "chill," and the periodic influence is established.

It must be remarked, that these symptoms do not flow from the *absorption of bile into the system*, for this result may ensue and be attended with no serious evil for some time; but it is the *retention within the system of the elements* out of which the bile is formed, which poisons the nervous centres, and if not obviated, eventuates in death.

We cannot do better than quote Dr. Carpenter's words in this connection:—"When from any cause the secretion of Bile is *suspended*, the substances at the expense of which it is formed accumulate in the blood; and their excrementitious character is strikingly demonstrated by the disturbance of other functions, especially those of the *nervous system*, which ensues. When the suppression is complete, the patient suddenly becomes jaundiced, the powers of that system are speedily lowered, (almost as by a *narcotic poison*) and death rapidly supervenes. Where the secretion is diminished, but not suspended, the same symptoms present themselves in a less aggravated form.

It is probable that much of the disorder in the functions of the brain, which so constantly accompanies deranged action of the digestive system is due to the *less severe operation of the same cause*; namely, the partial retention within the blood of certain constituents of the bile, which should have been eliminated from the circulating fluid.

* * * * * The *reabsorption* of bile into the blood, as seen in ordinary cases of jaundice dependent upon the obstruction of the biliary ducts, does not act on the general system in a manner nearly so injurious as the *retention* of the matters at the expense of which it is formed, has been shown to do. * * * * * And when it is remembered that the greater part of the bile which passes into the intestinal canal is ordinarily destined for reabsorption, it seems fair to conclude that the matters which accumulate in the blood when the secreting action of the liver is suspended, *are not in the same condition* with those which are received back into it after being submitted to that action, and that the liver therefore, not merely separates them, but exercises a certain *transforming agency* upon them, as it is known to effect upon other constituents of the blood which pass through it."

Dr. Budd, upon a careful consideration of these facts, has arrived at the conclusion, that it is not the action of the retained materials themselves upon the system, which is so injurious; but that while circulating in the general current, some metamorphosis occurs, by which a more noxious poison is generated. This however, is a mere speculation, supported only by the analogy of Uræmia.

However this may be, such are the consequences of the suppression of the cutaneous function for any considerable length of time. Such accumulation of hydro-carbon may occur and frequently does, as a direct consequence of climatic conditions. Currents of thermo-electricity caused by the earth's motion from west to east, create unequal temperatures, these differences induce in the atmosphere either an increased or diminished capacity for retaining water in suspension.

But independently of the condition of a hot and humid air, the oxygenating process may be directly interfered with, by a deficiency of oxygen in the atmosphere. This may ensue as the consequence of certain electrical conditions, or from the poisoning of the atmosphere by gaseous exhalations, either from swamps, or other pestiferous causes.

The allotropic body called *ozone*, being the great disinfectant of nature, is generated under certain climatic conditions, much more profusely than under others. These conditions, so far as we know, are not definitely settled; but our own experience is, that a hot and dry season following a wet spring, is not only unsuited to its free evolution, but to its existence in the air. Probably the causes, are due to the fact of the copious chemical changes taking place from the surface of the earth, in consequence of the spring inundation and the subsequent heat. In this way, noxious compounds are generated, which require the ozoniferous agent to neutralize, and which rob the air of its presence. During seasons of plentiful thunder storms, however, with their sharp electrical manifestations, the allotropic oxygen exists in abundance, as may be easily determined by the ozone paper. These are the seasons, which are marked in malarious districts by good health. A copious rain-storm with its accompanying electrical discharges, occurring during a sickly season, will often arrest the sickness for several days.

Though our observations have not been made with the accuracy which we intend to use hereafter, yet the experiments of the last three years, have gone far to convince us, that there is a direct relationship between the amount of prevailing sickness, and the actual quantity of free ozone in the air.

During cold winter seasons, when the disinfectant properties of ozone are not required, it exists largely in the air, and oxidation is excessive; the diseases assuming the inflammatory type. This will be mentioned again.

There is reason to believe that ozone is also generated in the higher regions of the air, and is brought down with the rain-drops; hence the purifying influence of rain is partly due to this agent.

Here permit us to remark, though not relevant to the subject, that we have been under the conviction for some time, that as the peering eye of science, shall unravel the mysterious laws of nature, that this body will be found to be *closely allied to electricity itself*; of one thing we are convinced; that *oxygen is the active constituent of the electric fluid*, but whether in an allotropic state, or one of powerful combination, time alone will reveal. We have observed many singular things in our experiments with ozone, which we may present at some future time for your consideration.

Thus much for deficiency of oxygenating material in the air. But it must not be imagined, that these causes only, are competent to produce an accumulation of the hydro-carbon element in the blood. The liquid and solid ingesta of every person, enter largely into the process.

An individual who, during the hot season, partakes freely of the calorific food, whereby ample quantities of carbon are generated in the system, and that too, at a period when the respiratory process is much less active, because of a diminished quantity of oxygen in the air, and particularly if it be humid, impeding exhalation not only from the lungs, but likewise from the skin, is apt to suffer the same consequences.

Nature has taught the rude Esquimaux in the frozen regions of the North, that to maintain his animal heat, he must live almost exclusively upon a carbonaceous diet. Accordingly we find him revelling with the delight of an epicure, upon such nauseous articles as "blubber," and "train oil." The same kind mother has taught the dark skinned Nubian, who basks beneath an equatorial sun, to ignore such food, and has furnished him with a plentitude of fruits and vegetables, which, while they produce the requisite histogenetic materials, yield large quantities of water; this being exhaled from the skin, by its evaporation, keeps down the actual temperature of his blood, to that of his ice-bound brother in the frigid zone.

Between these extremes, we have two classes of disease, according to the temperature and atmospherical condition of the locality. In high latitudes, marked by long and cold winters, and condensed dry air, oxygen exists in abundance, and the tendency is to *inflammatory affections*, brought about by *excessive oxidation*. But when we merge into a higher temperature, where the air is rarefied, humid and deficient in oxygen, then are brought into view an entirely different set of diseases, marked by *imperfect oxygenation*, and a consequent accumulation of hydro-carbon in the system. These are no theoretical speculations, but well attested facts.

Let us see then, how observation would teach us to regard periodic fevers, as diseases dependent upon *imperfect oxygenation*. First then, the localities in which they occur is strong presumptive evidence, that such is the case. What is the fact connected with their attacks? It is notorious that those persons who are exposed to atmospherical alternations; the hot, beaming sun of mid-day, and the cold dews of night impregnated with the nocturnal, vegetable exhalation of carbonic acid; who are badly clothed; badly fed; eating sparsely of fruits and vegetables, and largely of a carbonaceous diet, as fresh and salt pork, which has lost its soluble salts by "pickling"; those living in

illy-ventilated habitations, particularly if they be near some pond or stagnant puddle, where carburetted hydrogen, carbonic acid and other gases not only poison the atmosphere, but by their strong attachment for oxygen, *rob it of that element*, to say nothing of the vaporous cloud by day, and the dense fog by night, interfering with the cutaneous exhalation; those whose systems are not only enervated by the stimulus of solar heat, but also by bad whiskey; these are they who suffer mostly from attacks of the disease, while the better class, who are enabled to adapt their regimen to the requirements of the system; to protect themselves against climatic conditions, avoiding the heat of the day, and the dews of the night, are they who enjoy almost entire immunity.

The infamous Pontine Marshes are an example of this. The nobility live with impunity upon the borders, during a season rife with disease, by retiring into their houses before the cooling of the earth has condensed the watery and gaseous exhalations, and not venturing forth in the morning before the genial sun has again dissipated them.

Folchi upon observation of such facts in Rome and the adjoining Campagna, renounced the malarious doctrine. Napoleon during his campaigns in Italy took advantage of this and protected his army from the incursions of the endemic diseases, by building camp fires after the going down of the sun. The inhabitants of our Western States are acquainted with this fact, but unfortunately, the hardships and discomforts of a pioneer life, do not permit them to profit by it. When, after a few years of labor, they have accumulated a sufficiency to attend to these hygienic principles, and cultivation has drained the locality of its swamps and sloughs, with their attendant fogs, strangely enough, periodic fevers almost disappear; and yet none of the requisites for vegetable decomposition and the consequent evolution of miasmata, are done away with.

What seasons are they, which are marked by the greatest prevalence of these fevers? Every experienced Western man will tell you, that it is after a spring marked by copious and prolonged rains, followed by a hot summer, that the ravages are greatest. In other words, when the earth, thoroughly saturated with water, is acted upon by a summer sun, and the locality enveloped in a cloud of steam by day, and a pall of fog by night. These are the times, when the reading of the *barometer* constantly gives notice of the great *density* of the atmosphere, that the destroying angel is abroad in his might. In the tropical atmosphere of Africa, and other places, where this class of disease is so fatal and pernicious, we are informed by writers upon the subject, that the dew-point is but 5° below the maximum heat of the day. Does it require the aid of malaria to explain the ætiology of these diseases in such a locality? And yet, we will venture the assertion, that much of the same meteorological phenomena exist, proportionate to the intensity of the manifestation of the disease, in all other localities which it scourges. But a volume might be written upon atmospherical influences upon the human economy in the production of disease.

Let us look what evidences the *symptoms* furnish us, that this is a disease of *imperfect oxydation* :

Every indication, from the first inception of deranged action, points conclusively to the fountain-head of the difficulty. The languor, weariness, indisposition to thought, all tell us, that the great nervous centres have been cut off from their wonted supply of oxygen; while the pain or stitch in the side; the tenderness on pressure; the yellowish fur upon the tongue, perhaps; the yellowish or dull-bluish tinge of the conjunctivæ; the *craving for acid drinks*; and the urine which is scanty and high-

colored, but which, in all probability, upon being sufficiently diluted with clear water, will assume a *yellow hue*, evincing the presence of the coloring matter of the bile, the redness being a mere concentration of color; or failing in this upon being sweetened and adding pure sulphuric acid guttatum, will evince the beautiful play of colors from yellow to cherry, carmine and violet; and also from the diminution or absence of *phosphates* in the urine, showing that the destruction of nerve-tissue is interfered with, because of the impairment of the oxygenating process; all these unerringly indicate that the depurating function of the liver is interfered with, and the elements of the bile are being circulated through the channels of life.

The craving for drinks of an *acid character*, was mentioned above. This according to our observation, is a very frequent symptom of the fever when fully established. Almost the first question propounded by the patient to the physician when called to treat a case of fever, is whether he may not have some lemonade, or even cider to drink. Oxygen is the great *acidifier*, (although technically doubted by some chemists,) and this demand is but the still small voice of nature calling for the needful element. But apart from these symptoms, although the various analyses of the blood of patients laboring under periodic fever, have not been very satisfactory, because, perhaps, not conducted with the requisite care and skill; yet Cozzi's analysis in four cases demonstrated, in the majority, a *large excess of cholesterin, and scarcely any phosphates*, while the bile-pigment was in excess.

Do we here need a finger board to point the road to the suffering organ? Prof. Jos. Jones of Georgia, in a very elaborate essay read before the American Medical Association, at its meeting in 1859, says that during the malarial fever, animal starch accumulates in the liver and that there exists an absence of grape sugar. To our mind, this strongly evinces the extent to which the *transforming* power of the liver is perverted.

The *spleen*, we consider also, to furnish evidence of the hepatic origin of periodic fever. Among the first symptoms of the derangement of health is a pain over the region of the spleen, sometimes of an acute and lancinating character, though generally described as a simple soreness. This exists before the phenomena of the chill are manifested, and cannot be due to distension during the cold stage, because preceding it sometimes for days. It evidently arises from a condition of *passive hyperamia* in the organ, and is the result of the portal derangement. In thin subjects, a very careful percussion will detect a slight abnormal dullness over the left hypochondrium. If now, free bilious stools be produced, the unpleasant visitor speedily vanishes, for the very simple reason that the cause is removed. This is a matter of such common observation, that it need not be dwelt upon. It must have been the constant relationship between disorder of the liver and spleen, that induced M. Piorry, to regard the cause of periodic fever, as resident within the latter organ. If the admonishing symptoms already described, are allowed to go on, under the hope that they will "wear off", and a chill should occur, then indeed is the innocent spleen subjected to a distension, which if not soon obviated interferes most sadly with the part which, Kolliker, maintains, it plays in the manufacture of the red blood globules. You have all seen patients thoroughly blanched, even after one chill. Such is the case with a member of your association; a plethoric, florid man when in health, but whom a single chill, is sufficient, to pale as white as snow.

But, we wish to remark, that it is not always the chill, which, driving the blood from the surface, produces the remarkable alteration in volume of the spleen. It is a subject of common experience, that the splenic tumefaction is nowise proportioned to the

severity of the chill; indeed, we have seen many cases of remarkable splenic engorgement, in which there had been *no chill at all*. How account for such cases, except as an obstruction to the splenic vein, dependent upon the portal torpor? Idiopathic affections of the spleen are of exceedingly rare occurrence, and its simple congestion in periodical fevers, is symptomatic of the functional transgressions of the liver. Prof. Jos. Jones, in the paper before referred to, thinks that the splenic alterations occur *anteriorly* to the febrile paroxysms. Thus much of the ætiology of this intricate disease, do we learn from observation of its functional lesions. But it is a little remarkable, that although these admonitions are unheeded by the miasmatisists, yet, that in their battle with this specific, hydra-headed monster, experience has taught them to use those means, which are best calculated to remove the condition above described. In the treatment of the disease, from the first feelings of indisposition, up to the fully developed remittent, they do not commence upon the anteperiodic; but precede it by some medicine which shall unload the portal congestion; produce copious "bilious stools", and in consequence, a remission if not a complete intermission in the fever; after which, they give the Quinine promptly, to break into the morbid nervous concatenation marked by periodicity. Thus, they do not give the "great antidote" until the *cause* is removed, or if they do, they signally fail in breaking up the disease, until such an action does take place, either naturally or by the intervention of science. We wish now to be understood as referring to ordinary attacks, and not to those where the symptoms are so violent as to require the immediate mitigation of the periodic manifestation, and the sustenance of the nervous system by stimulants under the narcotic depression of the poison, for fear of a speedily fatal issue. Even in such cases we but establish a *truce*, until we thrust the enemy out. We make these remarks with hesitation, because it places us in opposition to others, whose opinions we respect; but experience in every variety of treatment, has convinced us of their truthfulness.

The agent most frequently used for exciting the hepatic function is mercury, and of its preparations, the mild chloride is the most efficient. This remedy while stimulating the liver freely, is decomposed in the system and liberates chlorine, an agent that seems to exert an action upon that organ, second only to the mercury itself. Dr. Wallace in a paper published in the London Lancet in 1821, contends for a *specific* influence upon the liver, resulting from its use. Dr. E. D. Fenner, of New Orleans, we believe, employs it for the same purpose, although we have never seen his views upon the subject. Whether it acts by a specific influence upon the liver, or simply by virtue of its strong attraction for hydrogen setting free a certain portion of oxygen, we are not prepared to say, but experience has taught us to regard it as a valuable adjuvant in the treatment of these diseases, whether of their primary or secondary manifestations.

In the former, chlorine combined with mercury, as the mild chloride, is its most eligible form. But in cases, where the direct attacks of the disease have been broken up, and there is a tendency to hepatic torpor still existing as a sequence, we find the Chlorine Water, made according to a formula, we shall be glad to furnish you at any time, a most reliable article. Under the same conditions, the nitro-muriatic acid may be given, in doses of four or six drops in water or combined with the Tinct. Cinchona or Tinct. Gentian, with much success. But in that condition of cachexia, where the ravages of the disease, have so interfered with the function of the spleen, as to prevent its agency in the manufacture of the globular element of the blood, the

Tincture of the Chloride of Iron, is a remedy of rare efficacy. For while the Chlorine, (which by the way, is in excess in many preparations) plays its part in the hepatic laboratory, the Iron increases the number of the red globules in the blood, and consequently its *capacity for oxygen*, by which it is more perfectly decarbonized.

In administering this agent, however, it is generally necessary to overcome its tendency to constipation, by combination with some other remedy. But we did not intend to touch upon the therapeutics of the subject, save so far as might be necessary to illustrate its pathology.

Against all that has been said, however, and in favor of a specific cause of these fevers, is urged the *periodicity* attending them. This is a disease emphatically of the nervous system, whether it be caused by miasmata, or an imperfect oxidation of the blood. We need not call into requisition a *specific* agent to account for the periodicity. Periodicity is an *inherent* property of the nervous system, (fully demonstrated with reference to that portion called the sympathetic) and stamps its impress upon all diseases in which that system is seriously involved. The action of the heart is periodical. This cannot be due to the stimulus of the blood, for it will continue to beat some time after its removal from the body. This is strangely shown by the hearts of the inferior tribes. The heart of the Sturgeon when severed from his body, and hung upon a nail, will continue its rhythmical action for *four hours*. In these cases the motor power must be derived from the sympathetic ganglia found within its substance.

The uterus is periodical in its action, not only in reference to the menstrual nixus, but in the effort of parturition. The same is true of the rhythmic action of the stomach and intestines, and although these instances are valid only to show the periodicity manifested in the operations of the sympathetic, yet the agency of the medulla oblongata in maintaining the muscles of respiration in uniform rhythmic action, proves conclusively the same property of intermittency. The periodical tendency to sleep may also be adduced in illustration of this property, as well, perhaps, the tendency to wink at intervals, whereby the retina is afforded a short period of rest.

Neuralgiae, by their intermittent character are treated most successfully by antiperiodics, as Quinine and Arsenic, and this when they are disconnected with the possibility of malaria.

Strong excitation upon the extremities of centripetal nerves, may induce regularly intermittent paroxysms, as the introduction of a bougie, &c. When the medulla oblongata is stimulated through a centripetal nerve, as when cold is applied to the skin, the impressions are reflected, so as to produce movements, which, though they may be quick and almost convulsive, are yet combined in the plan of the proper respiratory acts. (Kirkes and Paget's Phys.)

We are all familiar, perhaps, with the experiment of M. Brachet, who for seven nights in succession, took a cold-bath at mid-night in the river Saone, after which he went to bed, and was soon in a profuse perspiration. At the end of seven nights, he discontinued the experiment, and much to his surprise, for seven nights more, a true ague fit, completing all its stages, occurred at the same hour; but was at length interrupted by a ride to a female in labor, just before the commencement of the paroxysm. The physiological application of this case is obvious. Cullen had some idea of this property of the nervous system, when speaking of a "diurnal revolution." "Whether this depends," he remarks, "upon the original conformation of the body, or upon cer-

tain powers constantly applied to it, and inducing a *habit*, I do not know; but the returns of sleep and watching, of appetites and excretions, and the changes which regularly occur in the state of the pulse, show sufficiently that in the human body, a diurnal revolution takes place." What may cause the differences in *type* of periodic fevers, as the quotidian, tertian, quartan &c, we do not know, unless it be an *intensification* of the cause, marked by the shortest periods. We believe then, that whatever may be the agent, which produces the so-called malarious fevers, that the periodicity is no part of it; but is an innate property of the nervous system brought into morbid development, by the pernicious operation of the poison.

It is urged against the view, which attributes periodic fevers to an accumulation of bile elements within the system, that these fevers seldom occur in old-settled communities. This to our mind, is one of the most potent objections to the miasmatic doctrine, for, however well-drained a country may be of its swamps and marshes, yet the requirements, of vegetation acted upon by heat and moisture cannot be done away with.

A much more rational conclusion would be to attribute the decline of the disease to better hygienic conditions brought about by the removal of pools &c, which keep the air saturated with moisture and pernicious gases; by better clothing; better dwellings and better habits in relation to labor, exposure and diet.

Of the diet may be particularly mentioned, that during the hot season it consists mainly of vegetables and fruits; luxuries almost unknown in the first settlement of a country. These contain much less of the carbonaceous constituents, than an animal diet, and being composed largely of oxygen and hydrogen, yield large amounts of water, which being exhaled from the skin reduces by evaporation, the animal temperature, and carries off the carbonic acid in vaporous suspension.

The inhabitants of tropical climates live chiefly upon rice and fruits, which yield the aqueous element very largely. The acid fruits, as the apple, pear, orange, grape, currant, gooseberry &c, in which the malic acid is the principal acidulous agent, and the lime, lemon and tomato, (according to Dr. Plummer,) in which the citric, figures most largely, are of peculiar service. The organic acids generally, besides the large proportion of "water of constitution" in them and which is necessary to their existence, contain an excess of oxygen over the amount required to form water with the hydrogen, and thus liberate a small portion of the oxygenating element to the blood. The liberal use of the tomato (*Solanum Lycopersicum*) is known to produce bilious stools, and recently it has been recommended to give it medicinally for that purpose. The organic acids combine with alkalies to form salts, and exist in that condition in many fruits and culinary vegetables.

The alkalies play an important part in the chemical quadrille.

They are found in vegetables and fruits in the condition of alkaline phosphates,—phosphate of soda, phosphate of potassa, and phosphate of magnesia; also as sulphate, chloride and phosphate of lime. The importance of these substances after having been submitted to the action of the human laboratory is well known. Yet the article which is most used as a constant diet in new countries is salted pork, from which these salts have all been removed in the process of pickling. The *materia alimentaria*, as a cause of disease or health, has not been sufficiently investigated, and will hereafter yield a rich harvest to the earnest laborer, who shall expound a system of laws to meet the different conditions of life into which man is thrown as an independent being.

It has been urged against the view, which we have attempted to put forth in the causation of periodic fevers, that sailors on shipboard, do not suffer from them.

We have already expressed our belief, that chlorine possesses a power, not heretofore generally assigned it; that of being a direct or indirect stimulant to the hepatic function. Can it be, that enveloped as seamen are, in an atmosphere impregnated with salt, (the chloride of sodium) that, that element is supplied to the system in quantities sufficient to prevent an accumulation of carbonaceous material?

We merely suggest the idea, without having given it much thought. Persons suffering from protracted intermittents often commence regaining their health upon a removal to the sea-coast, where they can "smell the salt air."

With these remarks, Gentlemen, we close a subject, which to us, has always been one of the deepest interest. The great prevalence of the disease in the field which we have chosen for our labors, renders it a matter of vital importance to the community that we should understand its nature and be ready to detect its myriad shapes, however masked they may appear. The treatment has not been touched upon in this paper, save so far as to illustrate its ætiology and pathology. That much of what we have said, is mere speculation, we are aware; but we are well convinced that when some favored devotee of our science, shall succeed in laying bare the nature of this mysterious foe, the road to such a happy consummation, will be found to have its departing point, in that but illy understood, and complex organ, the liver. Let it not be understood by these remarks that we countenance the rash mercurialization so frequent in the West.

The intelligent physician will distinguish the conditions we have endeavored to portray, and apply his remedies judiciously and according to the dictates of a scientific medication.

It has become fashionable among the miasmatists of late years, to brand those who recognize its all important function, with the taunt that they can see nothing but the liver. Notwithstanding such an ungenerous and narrow-minded insinuation, we have dared to announce our unqualified skepticism of the whole miasmatic doctrine, as being fallacious upon its face; dissonant with the accumulated experience of centuries, and unworthy of the enlightened age in which it is tolerated.

There is one property about it, which may well give us pleasure. Miasmata are dissipated it is said, by the sun. Let us hope, Gentlemen, that when the glorious sun of science, shall have risen in the zenith of his bright effulgence, this ghostly relic of a fanciful pathology, shall be banished into thin air, and forever lost in the wondrous infinitude of space.

LIBRARY OF CONGRESS



0 021 623 841 2

MAY 1961